CLAIMS

1. An electrode for use in an electrochemical cell, said electrode comprising a hydrogen storage material and a high energy density metal, wherein the hydrogen storage material and the high energy density metal are disposed in the electrode in a manner such that the high energy density metal is capable of acting as a hydrogen source for the hydrogen storage material on reaction with electrolyte in the cell and/or the high energy density metal is capable of acting as anode material for the cell.

2. An electrode according to claim 1, wherein the high energy density metal is at least one of Al, Zn, Mg and Fe, or an alloy of any thereof.

3. An electrode according to claim 1 or 2, wherein the high energy density metal is mixed with polytetrafluoroethylene.

4. An electrode according to any of claims 1 to 3, wherein the high energy density metal is mixed with graphite, said graphite increasing electrode conductivity.

5. An electrode according to any of claims 1 to 4, wherein the hydrogen storage material is an alloy selected from the group consisting of rare earth/misch alloys, zirkonium alloys, titanium alloys and mixtures of such alloys.

6. An electrode according to claim 1 or 5, wherein the hydrogen storage material is mixed with polytetrafluoroethylene.

7. An electrode according to any of claims 1 to 6, wherein the hydrogen storage material is mixed with carbon.

8. An electrode according to any of claims 1 to 7, wherein the hydrogen storage material is a metal hydride selected from the group consisting of AB_5, AB_2, AB and A_2B, where A is a Group IIb metal, transition metal, rare-earth metal or metal of the actinide series and B is a metal of the transition series.

9. An electrode according to claim 8, wherein:
AB_5 has hexagonal or orthorhombic structure and is $LaNi_5$ or $NmNi_5$, where Nm is a combination of La and other rare-earth elements;
AB_2 is $ZnMn_2$ with a Laves phase structure;
AB is TiFe with a CsCl structure; and
A_2B is Ti_2Ni with a complex structure.

10. An electrode according to any of claims 1 to 9, which further comprises a hydrogen electrocatalyst.

11. An electrode according to claim 10, wherein the hydrogen electrocatalyst is a noble metal, Ni, Fe, Cr or an alloy comprising at least one of these metals.

12. An electrode according to claim 10 or 11, wherein the hydrogen electrocatalyst is in the form of a pure powder deposited on a high surface area support material.

13. An electrode according to claim 12, wherein the high surface area support material is activated carbon or graphite.

14. An electrode according to any of claims 1 to 13, wherein the high energy density metal and the hydrogen storage material are in the form of a single sheet.

15. An electrode according to any of claims 10 to 13, wherein the high energy density metal, the hydrogen storage material and the hydrogen electrocatalyst are in the form of a single sheet.

16. An electrode according to any of claims 1 to 13, wherein the high energy density metal is in the form of a first sheet and the hydrogen storage material is in the form of a second sheet.

17. An electrode according to any of claims 10 to 13, wherein the high energy density metal and the hydrogen electrocatalyst are in the form of a first sheet and the hydrogen storage material is in the form of a second sheet.

18. An electrode according to any of claims 10 to 13, wherein the high energy density metal is in the form of a first sheet, the hydrogen storage material is in the form of a second sheet and the hydrogen electrocatalyst is in the form of a third sheet.

19. An electrode according to any of claims 14-18, wherein a mesh current collector is pressed or calendered into one of the sheets.

20. An electrode according to any of claims 1 to 19, wherein the high energy density metal is in the form of a solid plate, pellets or powder.

21. An electrode according to any of claims 1 to 20, which comprises: an energy carrier layer; a catalyst layer; a hydrogen absorption layer; and one or both of a mesh current collector and a mechanical support.

22. Use of a hydrogen storage material in an electrode of an electrochemical cell, said electrode also containing a high energy density metal, for absorbing hydrogen produced by reaction of said high energy density metal with electrolyte in said cell.

23. Use of a high energy density metal in an electrode of an electrochemical cell, said electrode also containing a hydrogen storage material, as a hydrogen source for said hydrogen storage material on reaction of said high energy density metal with electrolyte in said cell.

24. A method for the production of an electrode for use in an electrochemical cell, said electrode comprising a hydrogen storage alloy and a high energy density metal, the method comprising:

sintering or forming with a binder at least one of a high energy density metal and a hydrogen storage alloy into at least one thin sheet; and
calendaring or pressing said at least one sheet to form the electrode.

25. A method according to claim 24, wherein porosity is controlled by using polytetrafluoroethylene as a binder.

26. A method according to claim 24 or 25, wherein particle to particle contact is increased by adding carbon.

27. A method according to any of claims 24 to 26, wherein a current collector is pressed or calendared into said at least one sheet.

28. A metal-air fuel cell or metal hydride battery cell comprising as anode an electrode according to any of claims 1 to 21.

29. A metal-air fuel cell wherein the negative electrode comprises a high energy density metal and a hydrogen storage material, said hydrogen storage material being disposed within the electrode such that it is adapted to absorb hydrogen produced by reaction of high energy density metal and electrolyte in said cell.

30. A metal hydride cell wherein the negative electrode comprises a high energy density metal and a hydrogen storage material, said high energy density metal being disposed within the electrode such that it is adapted to provide a hydrogen source for the hydrogen storage material on reaction with the electrolyte in said cell.

31. A cell according to claim 30 which is a nickel-metal hydride cell.

32. Use of a hydrogen storage material in combination with a high energy density metal in an electrode in a metal-air fuel call for prevention of corrosion of the electrode.

33. Use of a high energy density metal in combination with a hydrogen storage material in an electrode in a nickel-metal hydride battery to provide self-charging in the battery.

34. Use of a high energy density metal in combination with a hydrogen storage material in an electrode in a nickel-metal hydride battery to provide increased energy capacity in the battery.

35. Use of a high energy density metal in combination with a hydrogen storage material in an electrode in a nickel-metal hydride battery to provide increased peak power in the battery.

36. Use of a high energy density metal in an electrode in a nickel-metal hydride battery to prevent corrosion of the metal hydride by arranging galvanic coupling between separated layers containing high energy density metal and metal hydride respectively.

37. Use according to any of claims 22, 23 or 32 to 36, wherein the high energy density metal is Al, Zn, Mg or Fe.